BOROUGH OF MANHATTAN COMMUNITY COLLEGE
The City University of New York
Department of Mathematics

Title of Course: Linear Algebra   **Class Hours: 3**

MAT 315 - _____   **Laboratory Hours per Week: _____**

Semester_____

Instructor Information (Phone#, Office#, email):_____

Credits: 3

Course Description: The course covers the usual topics of a linear algebra course (e.g., vector spaces, matrices, linear equations) as well as several special topics required by coursework for electrical engineering students (Boolean functions, switching circuits, minimal Boolean functions).

Basic Skills: Students will be introduced to the nature of mathematical abstraction and formal proofs. The syllabus presents the standard content of similar courses and designed to be transferable to four-year institutions.

Prerequisites: Calculus II (MAT302) or equivalent with the departmental approval.

Corequisites:

Course Student Learning Outcomes (Students will be able to…)	Measurements (means of assessment for student learning outcomes listed in first column)
1. Express and solve systems of linear equations in matrix form using matrix operations.	**1.** Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.
2. Calculate determinants and apply them to solve system of linear equations (Cramer's Rule).	**2.** Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.
3. Identify vector space, subspace, and calculate the dimension of a vector space, kernel and the range of linear transformations.	**3.** Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.
4. Calculate eigenvalues and eigenvectors of a square matrix.	**4.** Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.

Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

	General Education Learning Outcomes	Measurements (means of assessment for general education goals listed in first column)
☐	**Communication Skills-** Students will be able to write, read, listen and speak critically and effectively.	Assignments and/or the home projects; exams and/or midterm exams; Final exam
☐	**Quantitative Reasoning-** Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Assignments and/or the home projects; exams and/or midterm exams; Final exam
☐	**Information & Technology Literacy-** Students will be able to collect, evaluate and interpret information and effectively use information technologies.	Assignments and/or the home projects; exams and/or midterm exams; Final exam

Evaluation and Requirements of Students: At the beginning of the semester, the instructor will advise the student of the determination of the final grade, which will be based on class work, tests, and the final examination. Students are required to attend all scheduled classes.

Outline of Topics:

TOPICS

Linear Equations in Linear Algebra
1.1 Systems of Linear Equations
1.2 Row Reduction and Echelon Forms
1.3 Vector Equations
1.4 The Matrix Equation Ax=b
1.5 Solution Sets of Linear Systems
1.6 Applications of Linear Systems
1.6 Linear Independence
1.7 Introduction to Linear Transformations
1.9 The Matrix of a Linear Transformation

Matrix Algebra
2.1 Matrix Operations
2.2 Inverse of a Matrix
2.3 Characterizations of Invertible Matrices
*2.4 Partitioned Matrices
*2.5 Matrix Factorizations

Determinants
3.1 Introduction to Determinants
3.2 Properties of Determinants
3.3 Cramer's Rule, Volume, and Linear Transformations

Vector Spaces
4.1 Vector Spaces and Subspaces
4.2 Null Spaces, Column Spaces, and Linear Transformations
4.3 Linearly Dependent Sets: Bases
4.4 Coordinate Systems
4.5 The Dimension of a Vector Space
4.6 Rank
4.7 Change of Basis

Eigenvalues and Eigenvectors
5.1 Eigenvectors and Eigenvalues
5.2 The Characteristic Equation
5.3 Diagonalization

5.4 Eigenvectors and Linear Transformations

Orthogonality and Least- Squares
6.1 Inner Product, Length, and Orthogonality
6.2 Orthogonal Sets
6.3 Orthogonal Projections
6.4 The Gram-Schmidt Process
6.5 Least Squares Problems

Symmetric Malices and Quadratic Forms
7.1 Diagonalization of Symmetric Matrices
7.2 Quadratic Forms
* Denotes Optional Material

College Attendance Policy
At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities
Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's website, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).